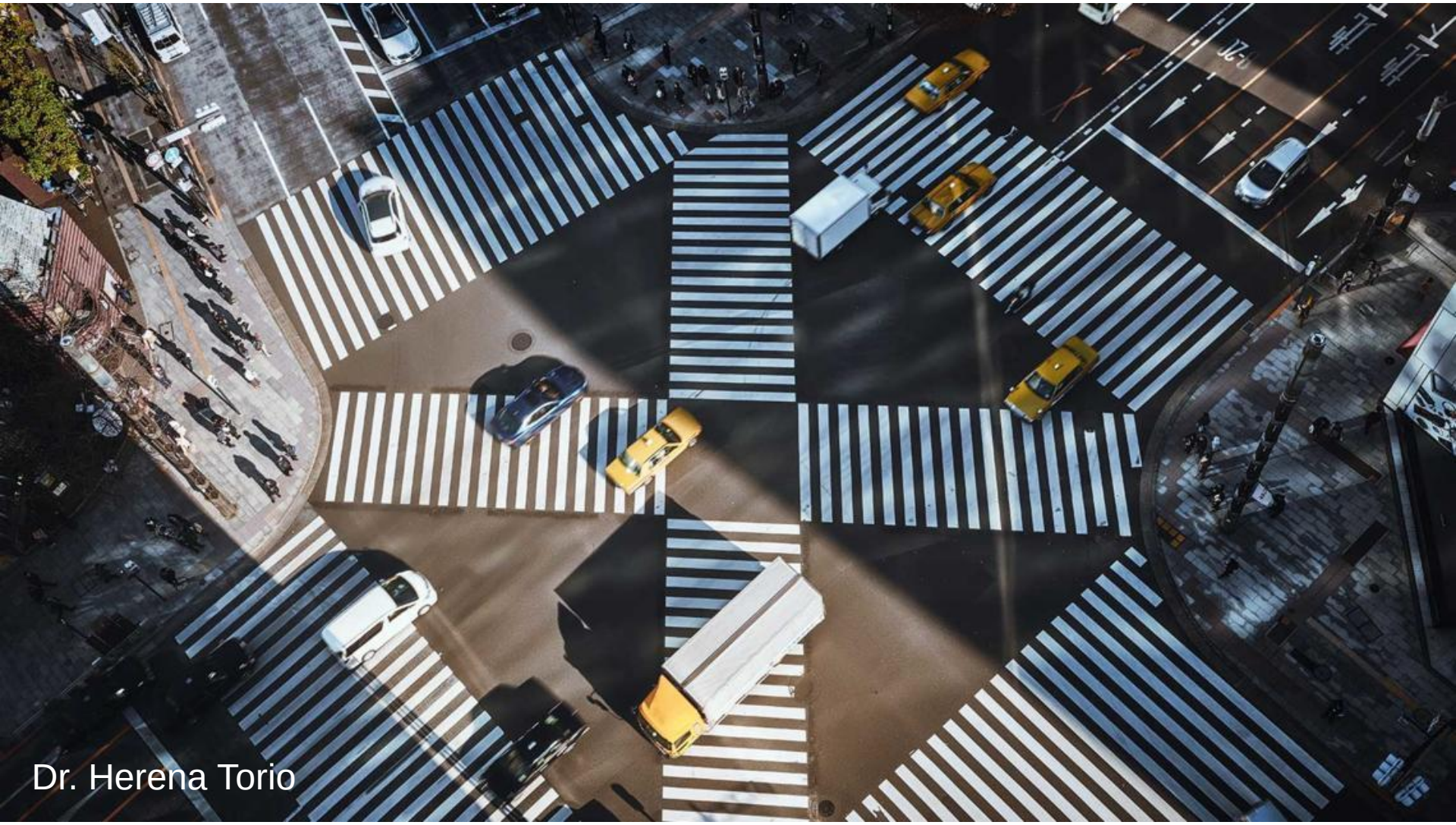
Introduction to Mobility



Dr. Herena Torio

Source: Paul Fielden, 2019. Link: https://www.wbcsd.org/Programs/Cities-and-Mobility/Transforming-Mobility/Transforming-Urban-Mobility/News/Arcadis-and-WBCSD-help-cities-transition-to-sustainable-mobility

Content

Selected Passenger Mobility Parameters

Vehicle-km
Vehicle x km

Person-km
Travelled km x “moved” people
(Goods: Travelled km x Tons)

Fatality Rate
Fatalities / 100.000 inhabitants

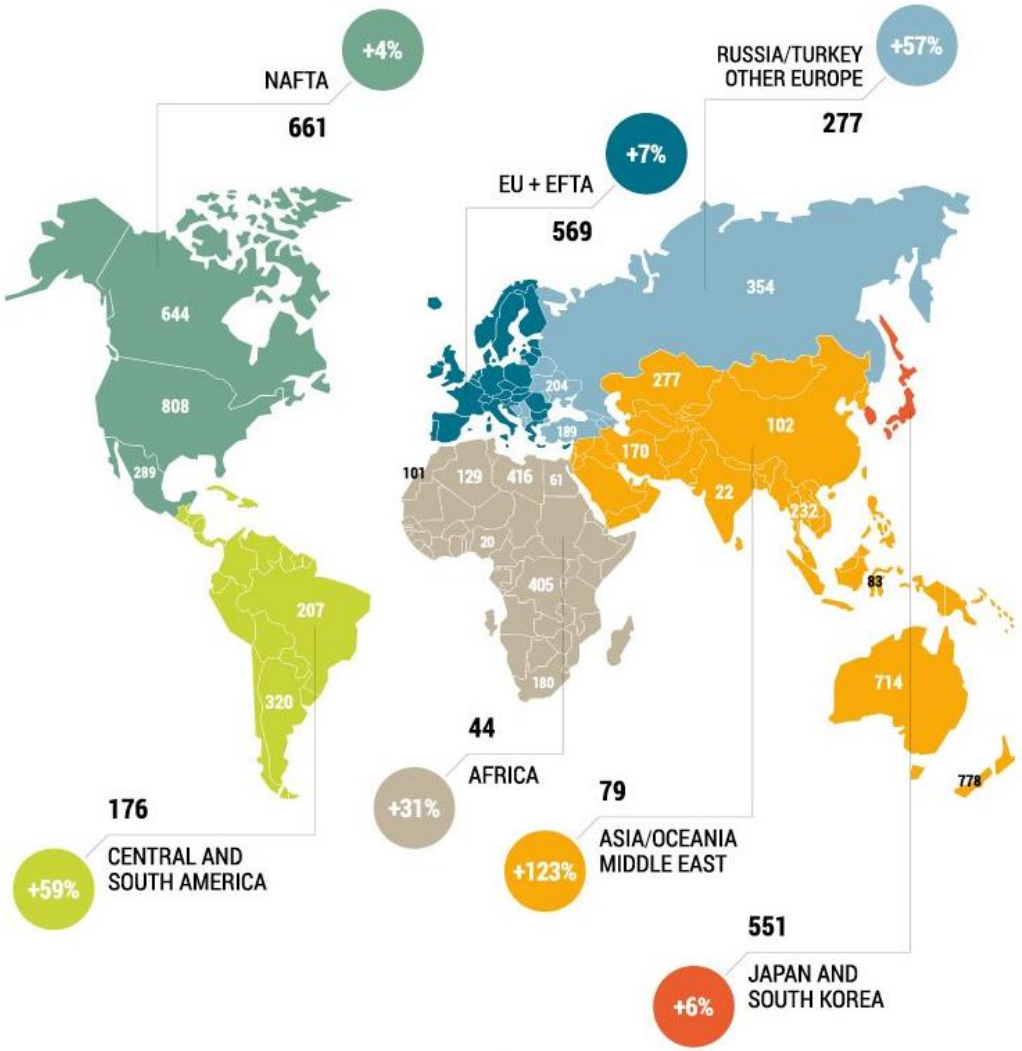
Selected Passenger Mobility Parameters

Motorisation Rate
cars / Mio inhabitants

Modal Share / Split
percentage of travelers using a particular type of transportation or number of trips using said type

Motorisation rate per 1,000 inhabitants

IN UNITS, % CHANGE
2014 – 2005



ACEA

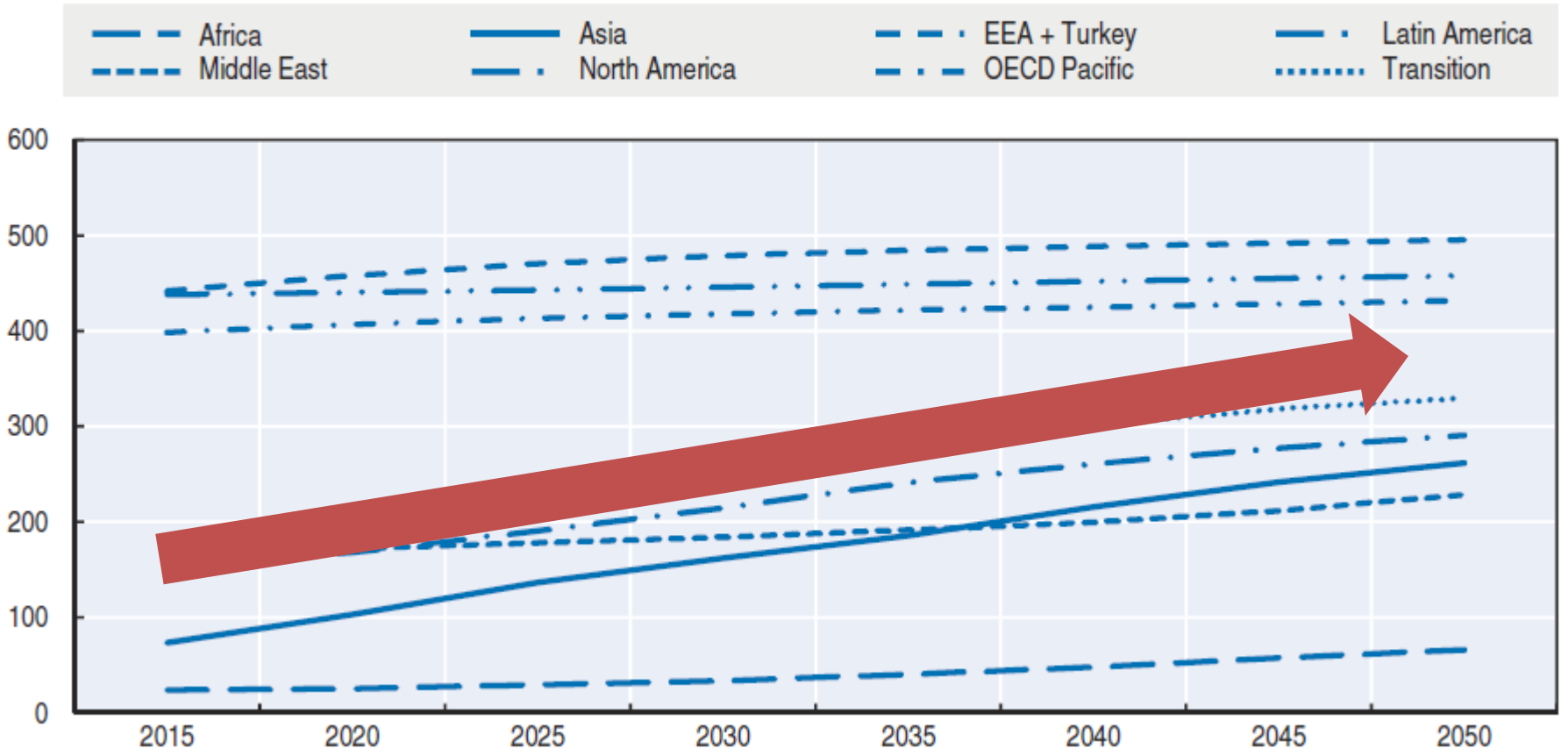
@ACEA_eu
WWW.ACEA.BE

Source: ACEA, 2018.

Motorisation rate

Figure 2.3. **Passenger car ownership by region**

Passenger car per thousand inhabitants, baseline scenario

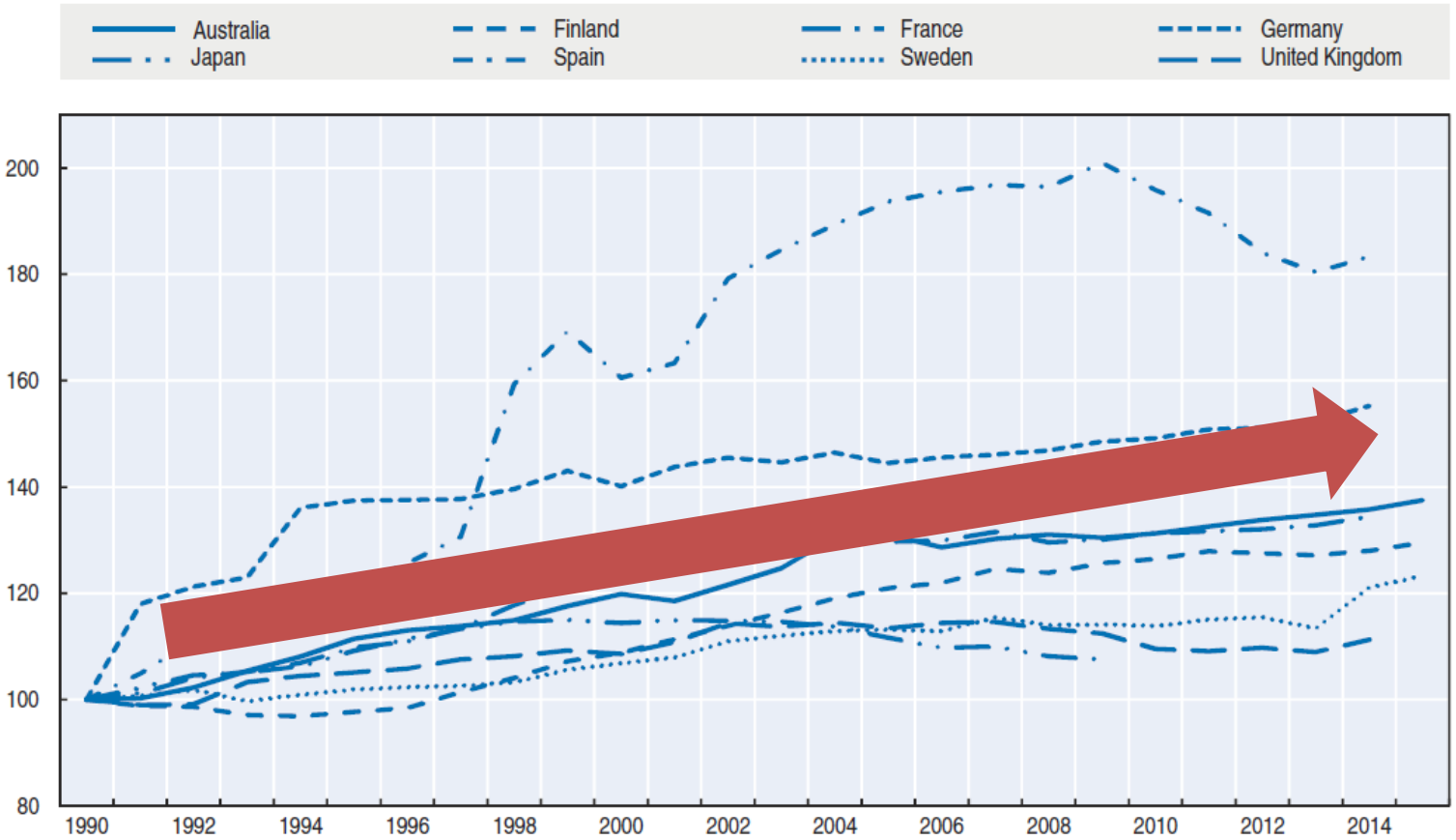


StatLink http://dx.doi.org/10.1787/888933442419

Passenger kilometers

Figure 1.9. **Passenger-kilometres by private car**

1990 = 100

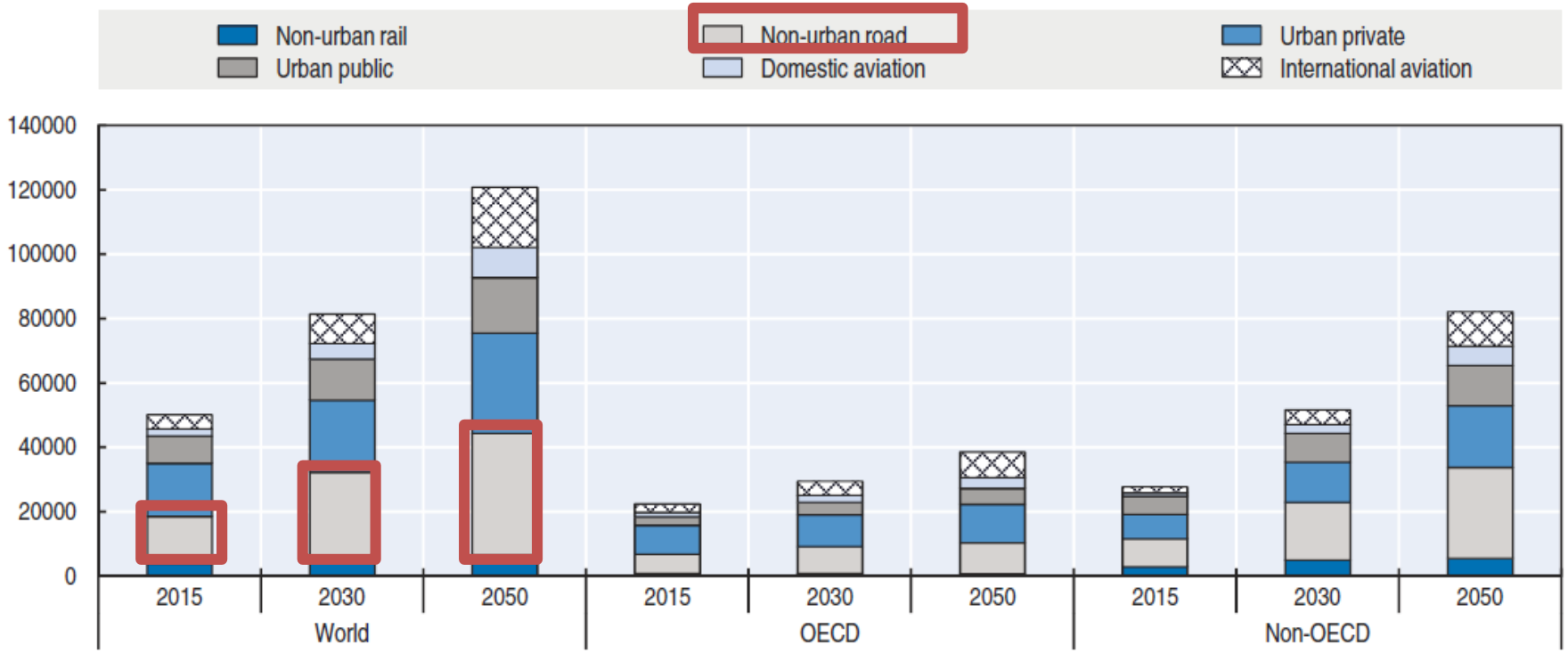


StatLink http://dx.doi.org/10.1787/888933442288

Passenger kilometers

Figure 2.1. **Demand for passenger transport by mode**

Billion passenger-kilometres, baseline scenario



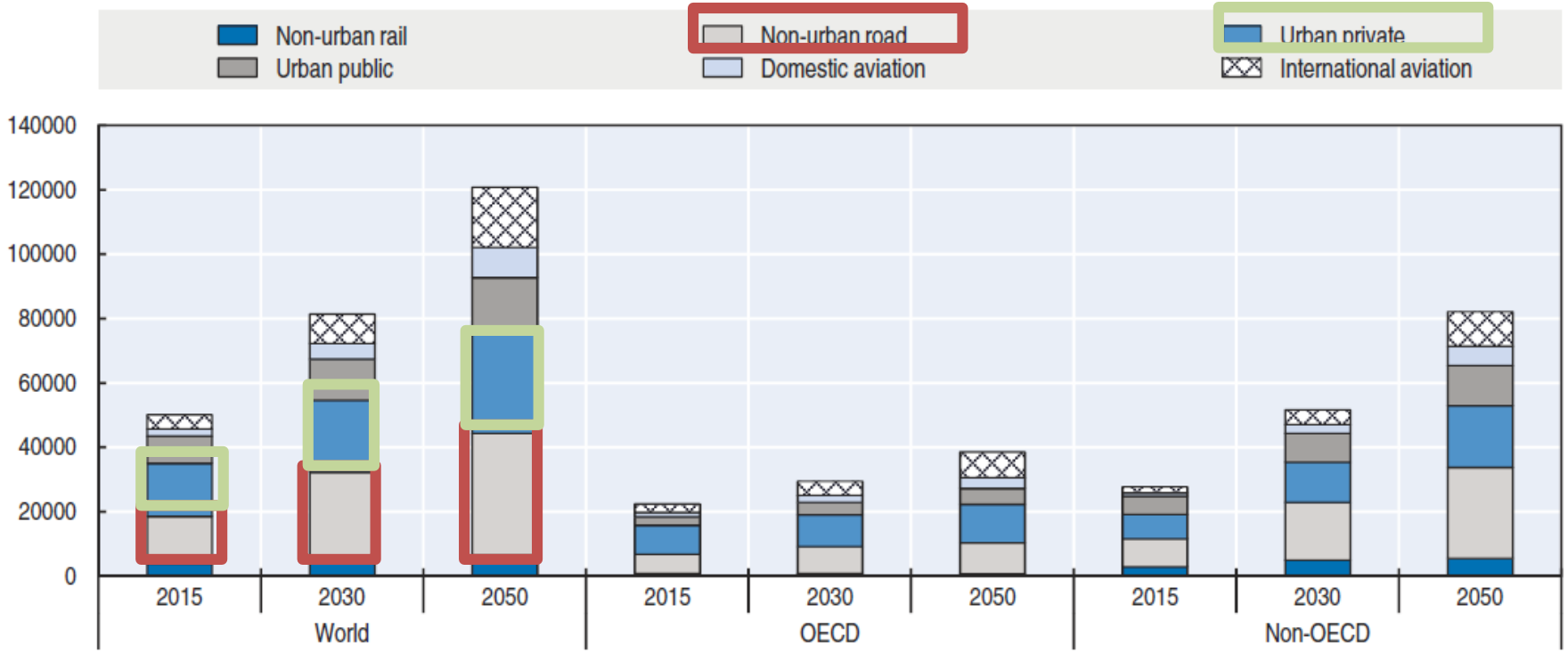
Note: International passenger numbers are divided equally between the country of origin and the country of destination.

StatLink http://dx.doi.org/10.1787/888933442391

Passenger kilometers

Figure 2.1. **Demand for passenger transport by mode**

Billion passenger-kilometres, baseline scenario



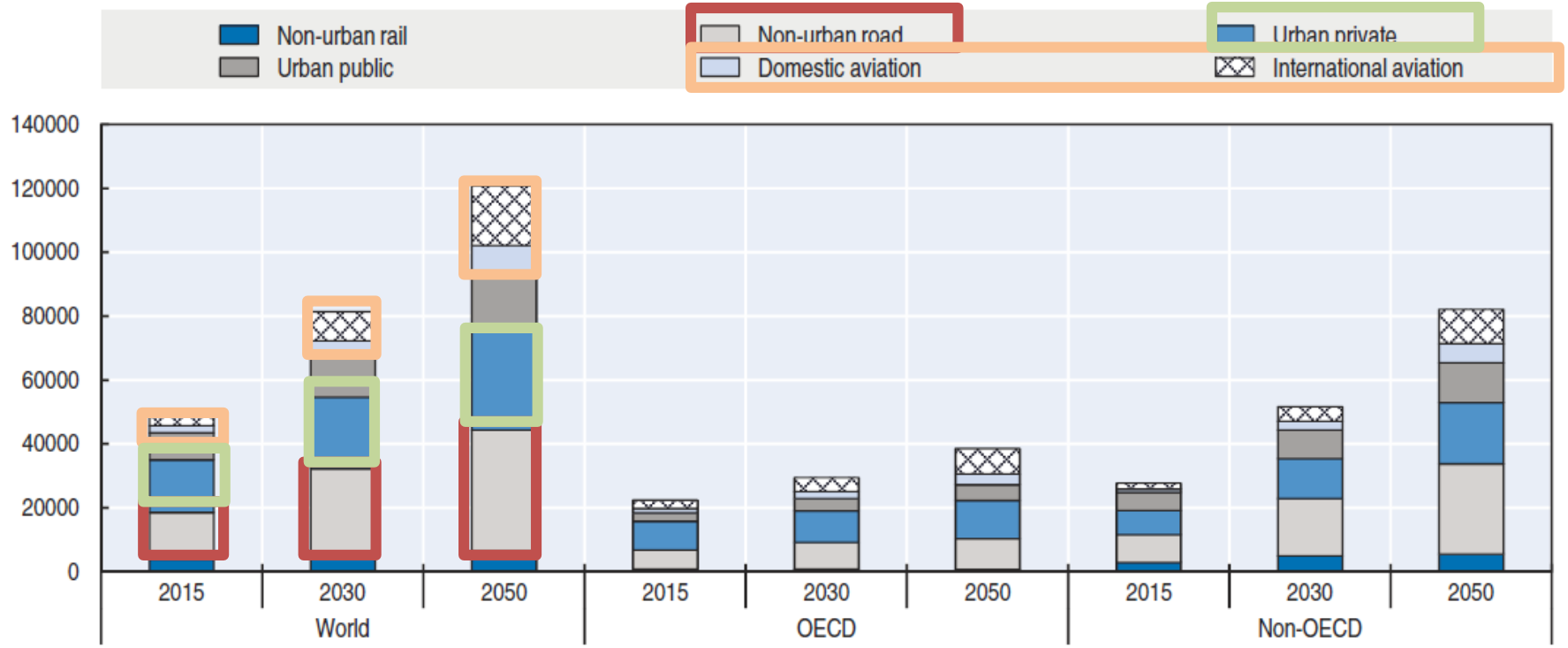
Note: International passenger numbers are divided equally between the country of origin and the country of destination.

StatLink http://dx.doi.org/10.1787/888933442391

Passenger kilometers

Figure 2.1. **Demand for passenger transport by mode**

Billion passenger-kilometres, baseline scenario



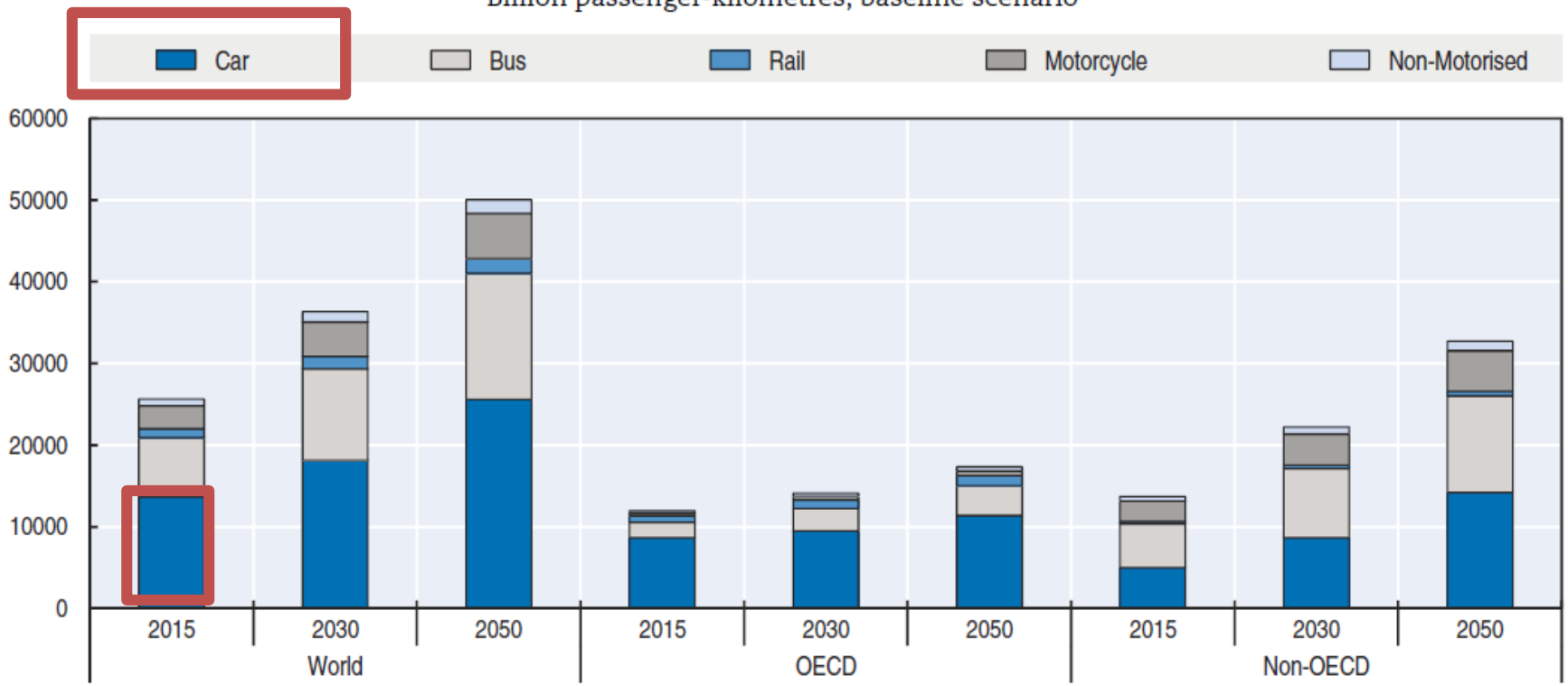
Note: International passenger numbers are divided equally between the country of origin and the country of destination.

StatLink http://dx.doi.org/10.1787/888933442391

Passenger kilometres: Modal split

Figure 2.5. **Urban transport demand by mode**

Billion passenger-kilometres, baseline scenario

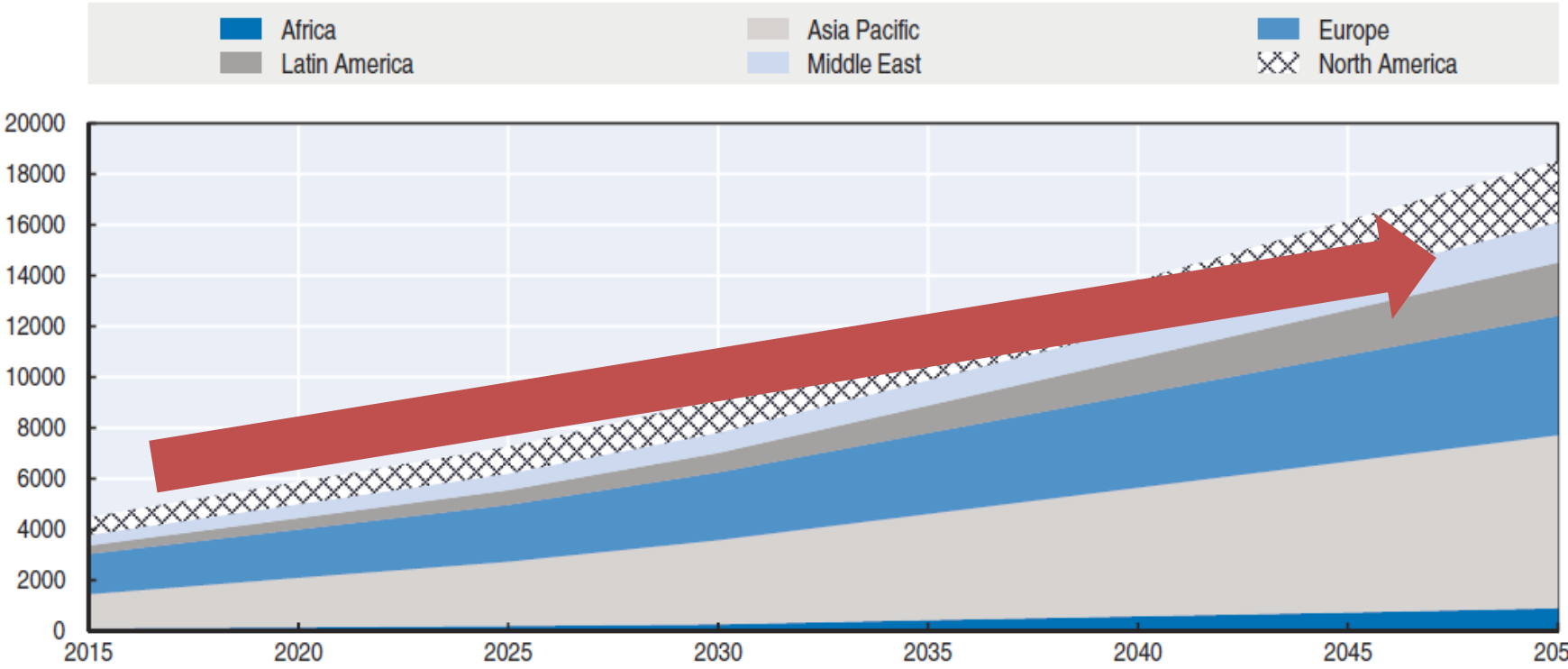


StatLink http://dx.doi.org/10.1787/888933442434

Passenger kilometres: Air travels

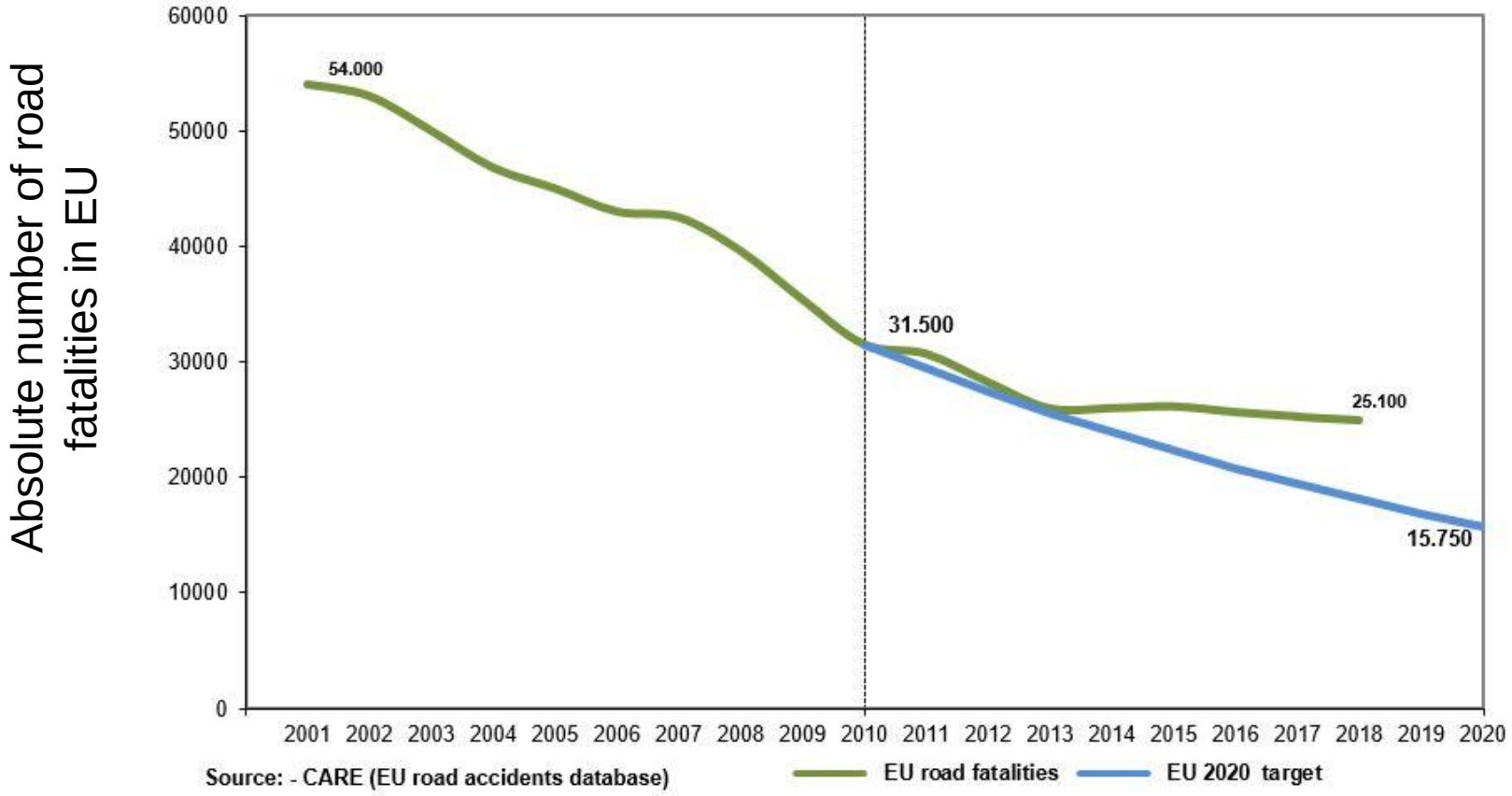
Figure 2.6. **International air transport demand by region**

Billion passenger-kilometres, by region of origin, baseline scenario

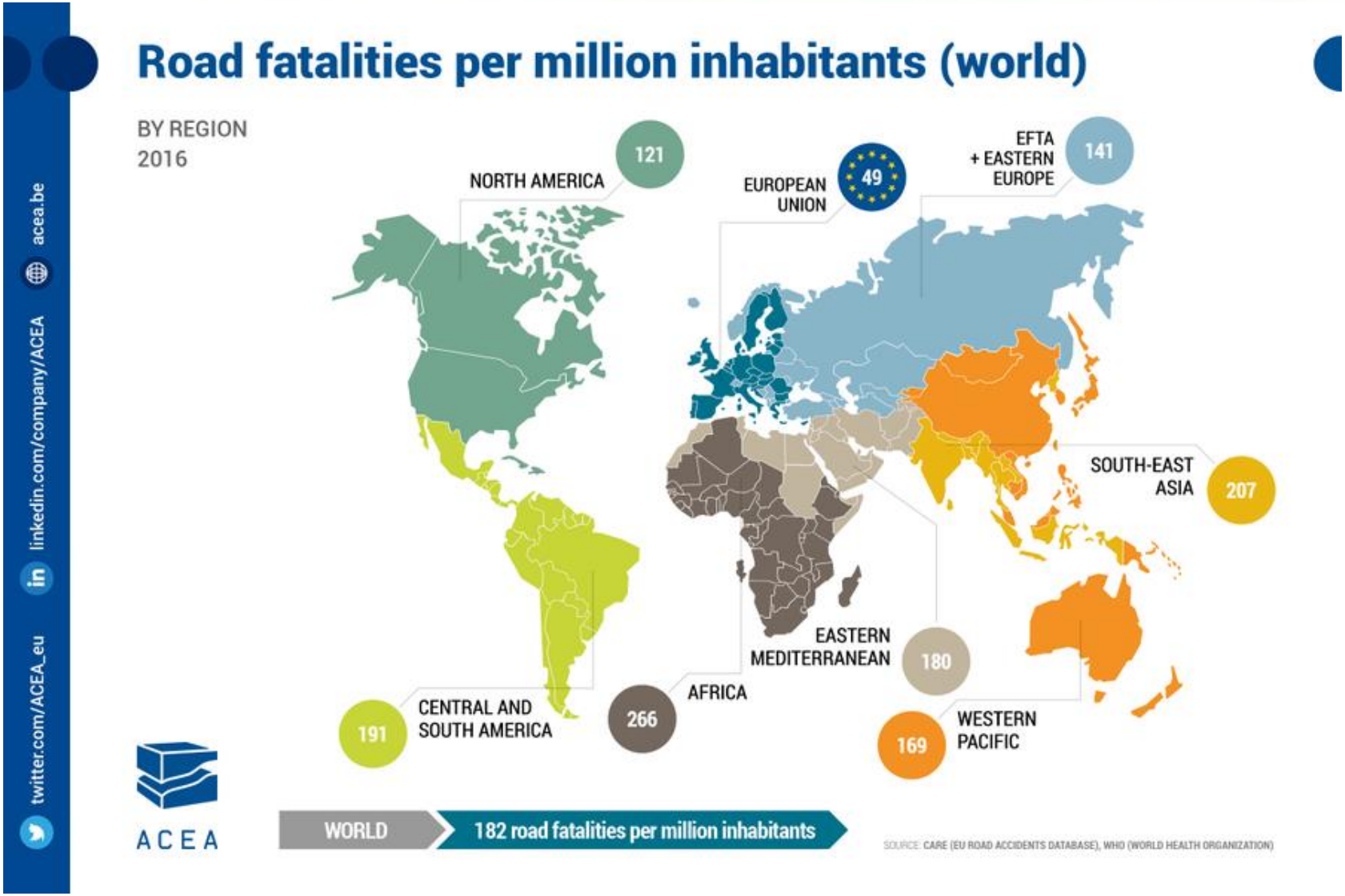


StatLink http://dx.doi.org/10.1787/888933442447

Fatalities

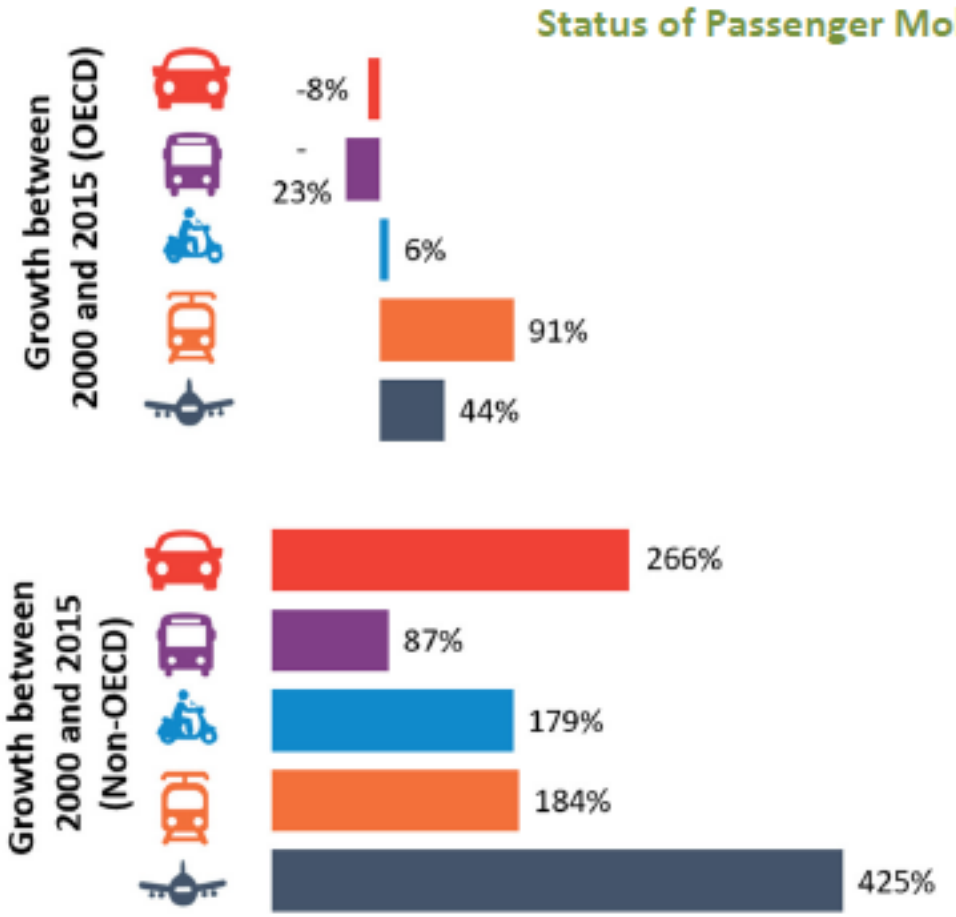


https://ec.europa.eu/commission/presscorner/detail/en/MEMO_19_1990



https://ec.europa.eu/commission/presscorner/detail/en/MEMO_19_1990

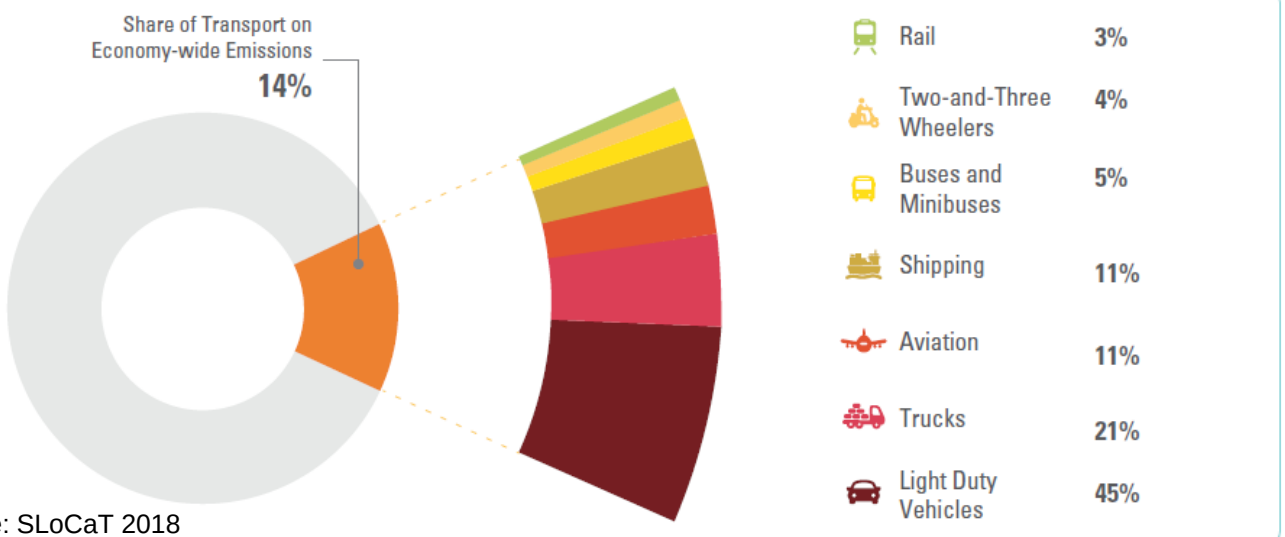
Travel demand growing worldwide, spurring increase in private motorization



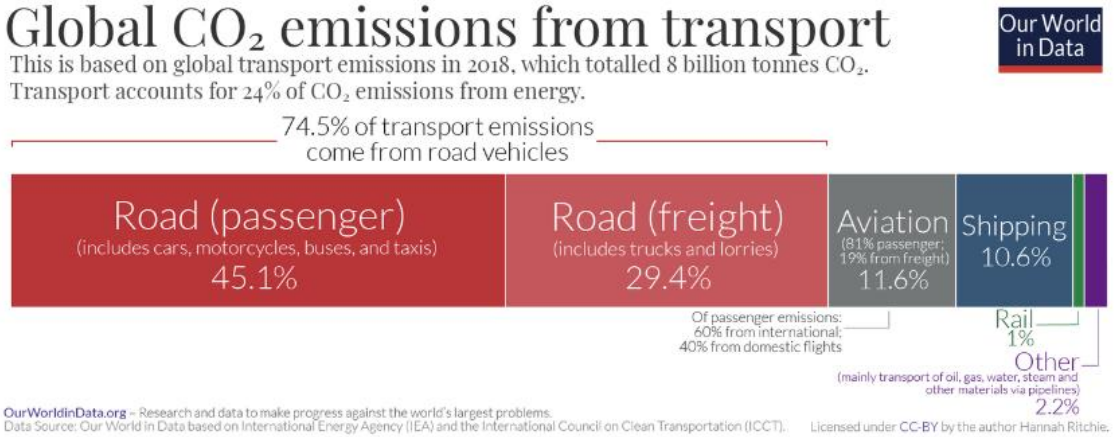
- Modal share shifts rapidly towards **private autos and air travel**
- **Public transport services** being less used in OECD and have slow growth in non-OECD

Source: IEA 2016

Figure 1: Share of Transport Sector GHG Emissions by Mode (2015)[11]



Source: SLoCaT 2018

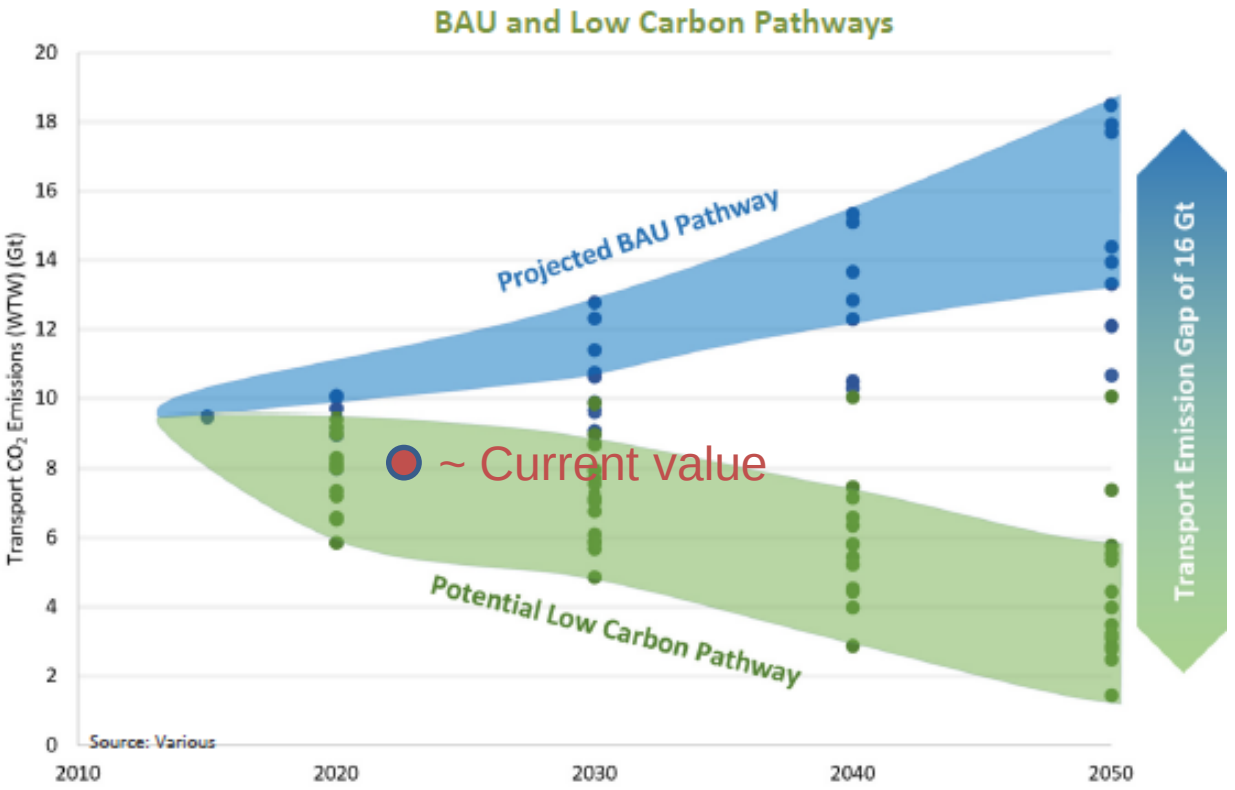


https://ourworldindata.org/co2-emissions-from-transport

Transport emission gap of 16 Gt

Emission gap growing, but low carbon transport has high mitigation potential

- **Business-as-Usual (BAU) pathways** project further increase, up to 18 Gt CO_2
- For transport to contribute to the **1.5 degree Celsius goal of the Paris Agreement**, CO_2 emissions have to go down to 2 Gt CO_2 by 2050



Source: SLoCaT 2018

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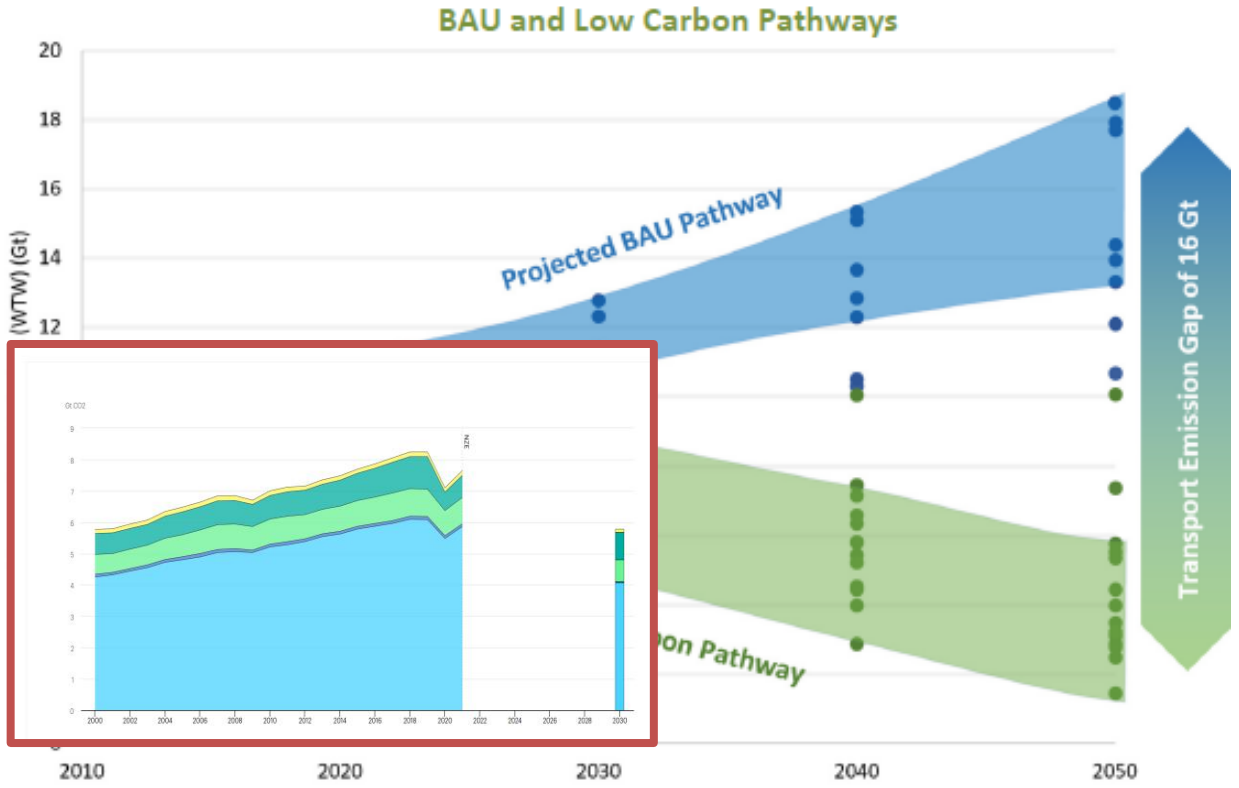


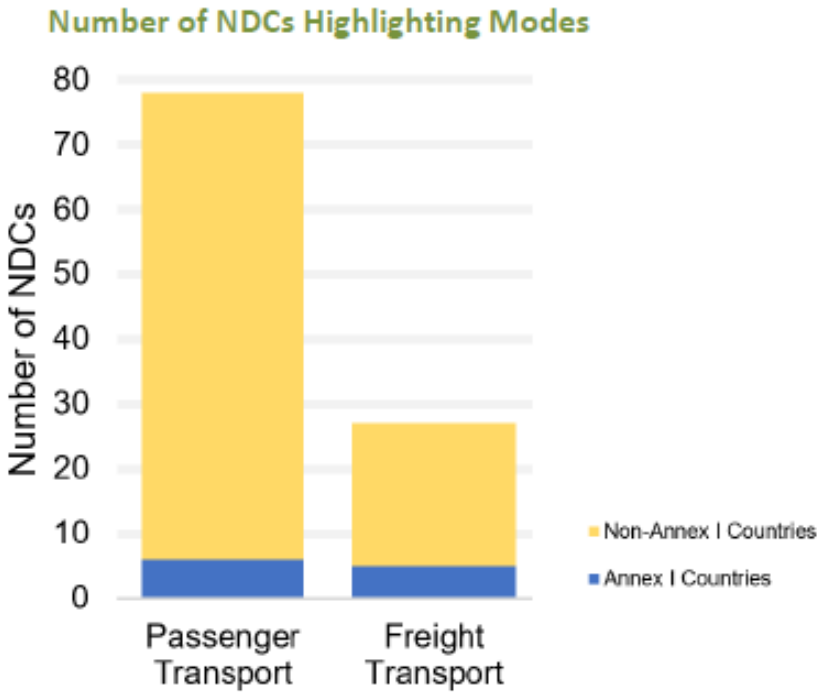
Source: SLoCaT 2018

Source: Global CO2 emissions from transport by sub-sector in the Net Zero Scenario, 2000-2030 – Charts – Data & Statistics - IEA

NDCs focus strongly on passenger transport

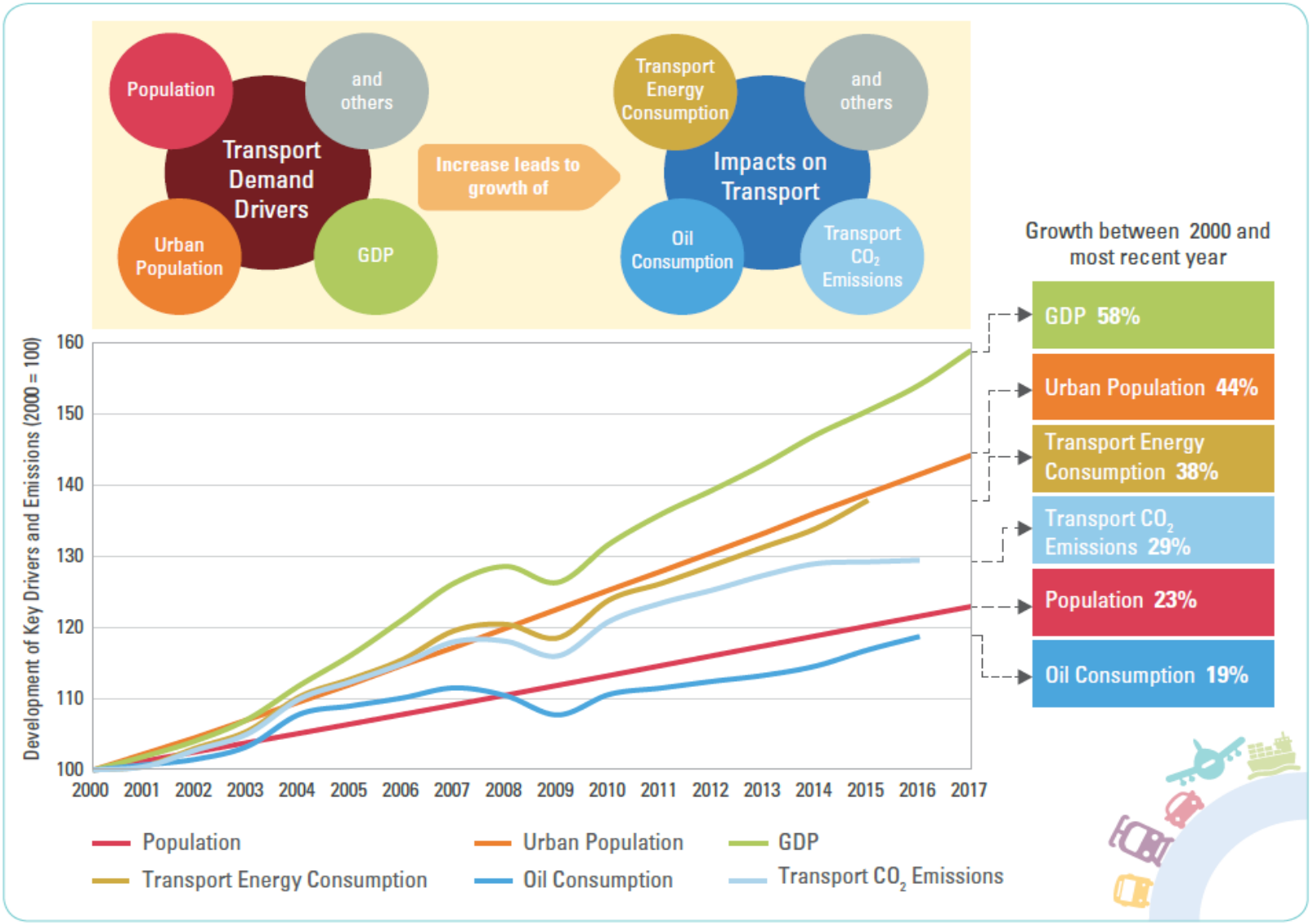
Transport measures in NDCs lack ambition and comprehensiveness

- **76% of the submitted 165 NDCs** highlight the transport sector as a mitigation source
- Only **8% of NDCs** propose transport sector emission reduction targets
- Passenger transport dominates over freight:
  - **62% of NDCs** highlight passenger transport measures
  - only **22%** focus on freight transport



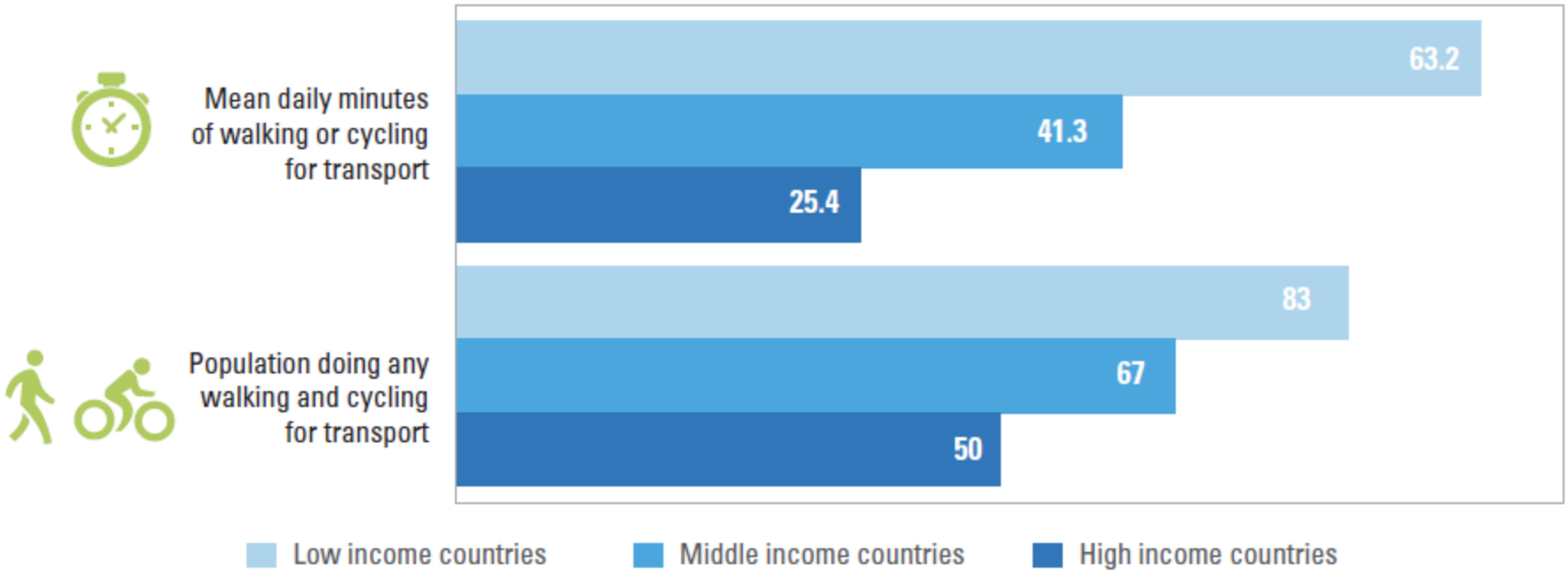
Source: SLoCaT 2018

Figure 6: Transport Demand Drivers and Impacts (2000 to 2017)[234]



Source: SLoCaT 2018

Figure 38: Walking and Cycling for Transport by Income Group[580]



Source: SLoCaT 2018

Summary

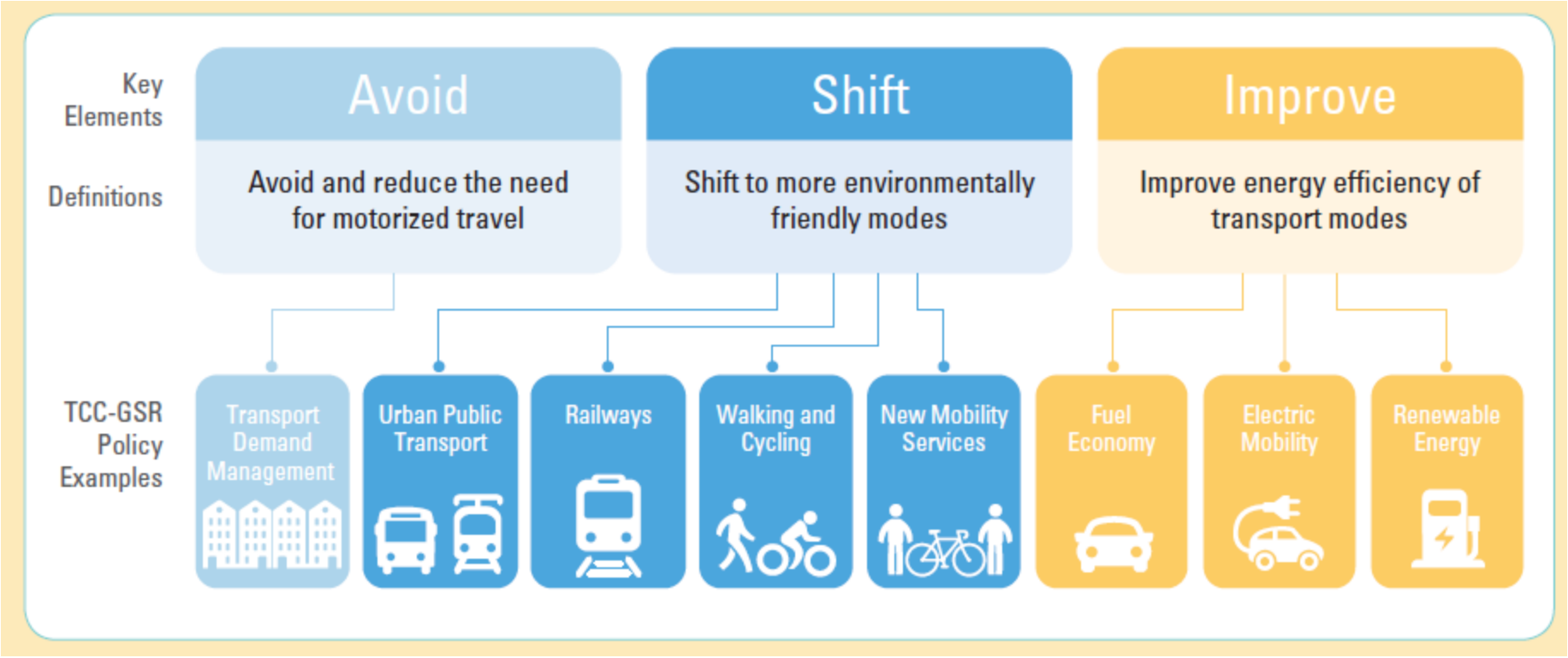
- Global passenger transport demand → still growing, (mainly in Asia: coupled to economic development)
- Motorisation rate -> saturation ca. 600 private cars / 1000 inhabitants
- Major driving forces for a transition: environmental concerns

- Trends for a change (public and private) → still marginal

- Passenger mobility → individualism and freedom in the modern society

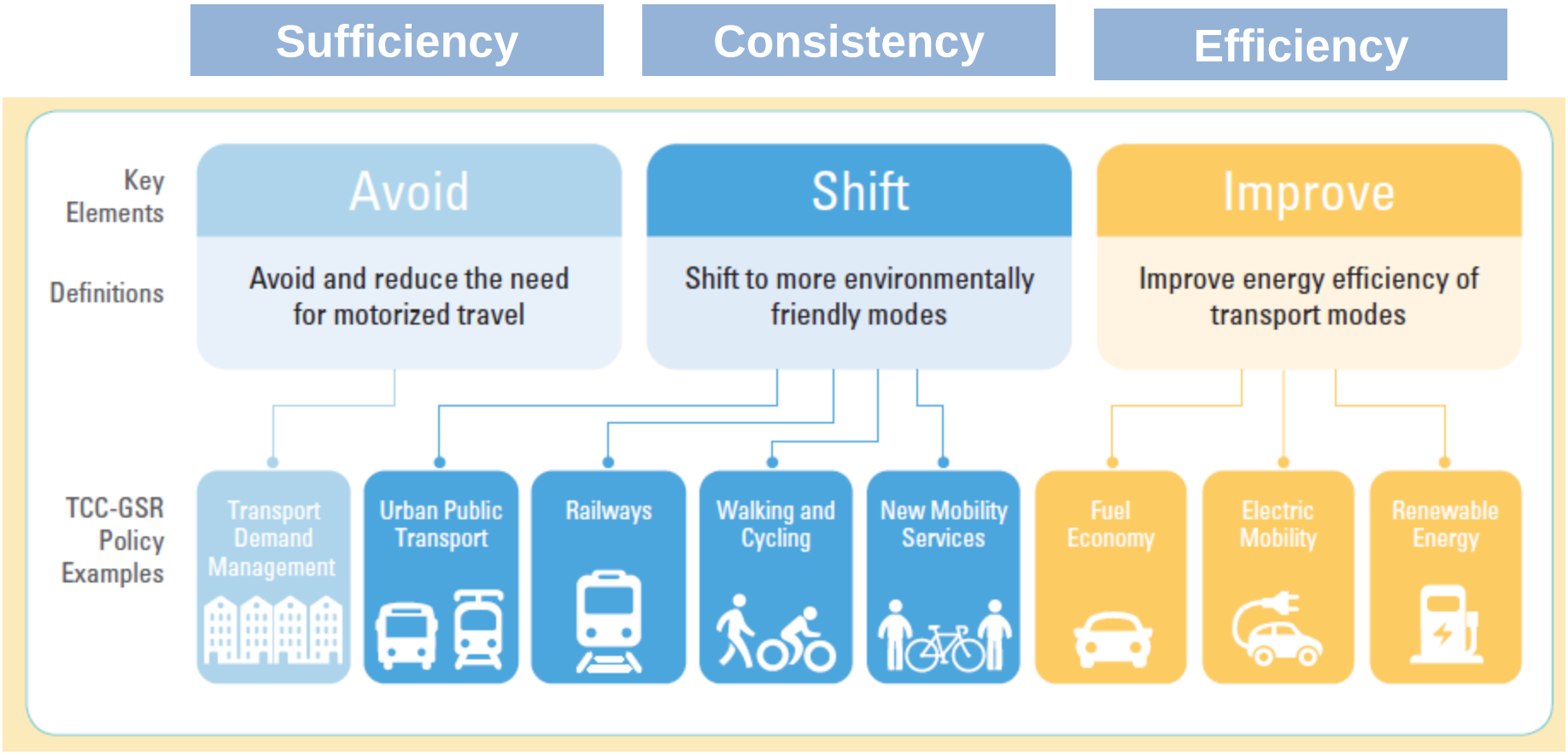
Content

Mitigation Strategies



Source: SLoCaT 2018

Mitigation Strategies



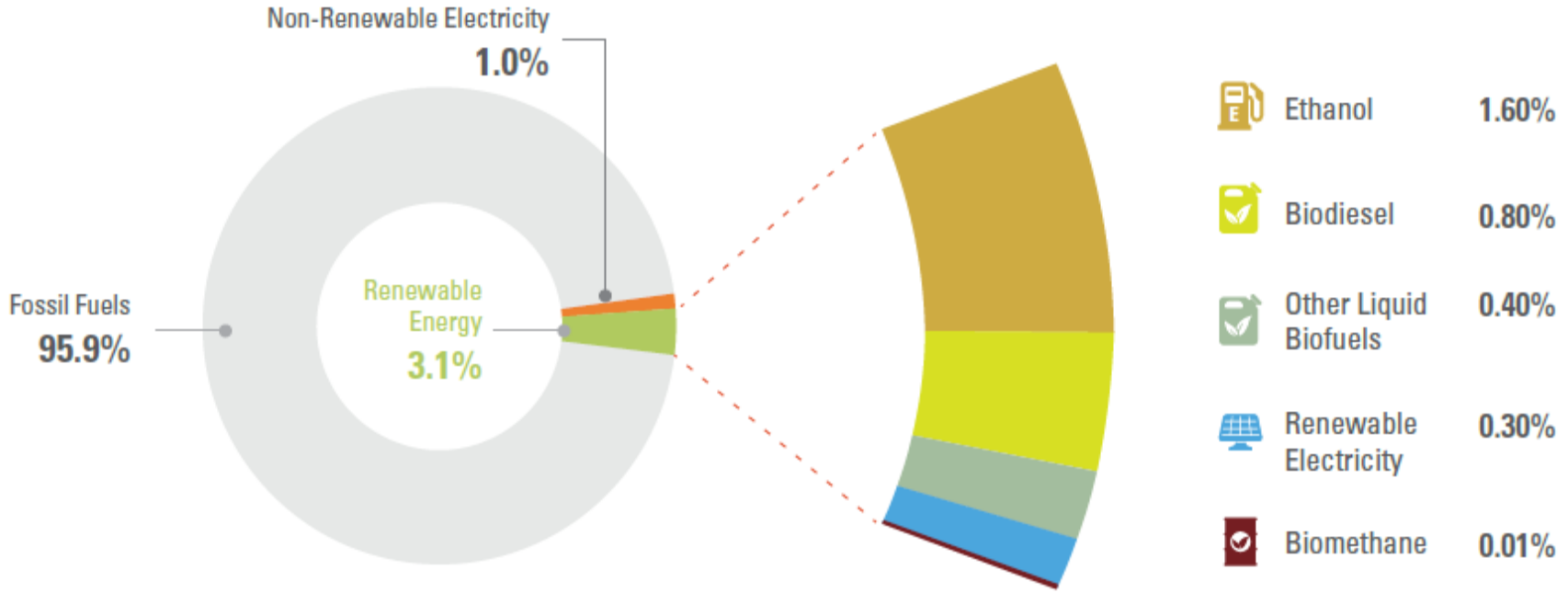
Source: SLoCaT 2018

Mitigation Strategies

Source: SLoCaT 2023; TCC-GSR 3rd edition First Insights_Final for dissemination

I. Consistency: RE for E-mobility?

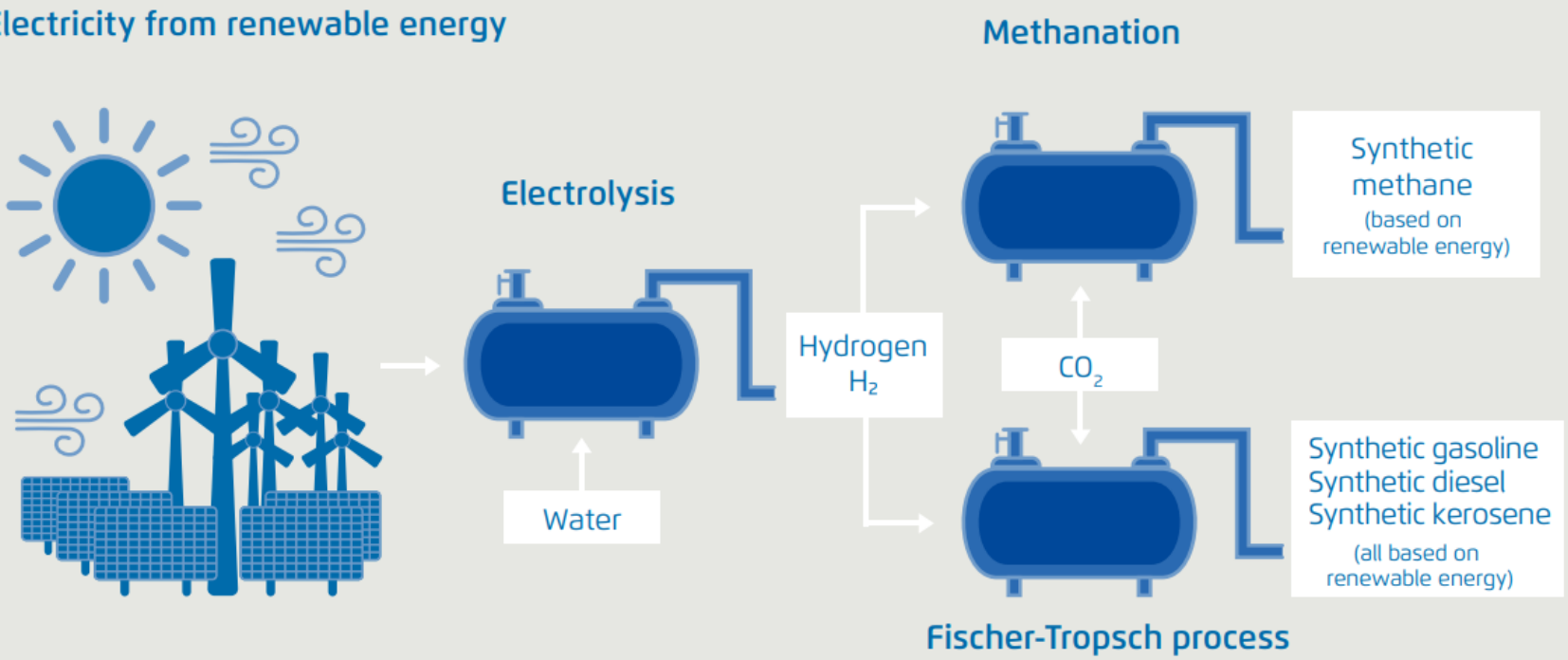
Figure 51: Share of Renewable Energy in Transport in 2015[815]



Source: SLoCaT 2018

I. Consistency: E-fuels (or "E-fools" (from: TE, 2021))?

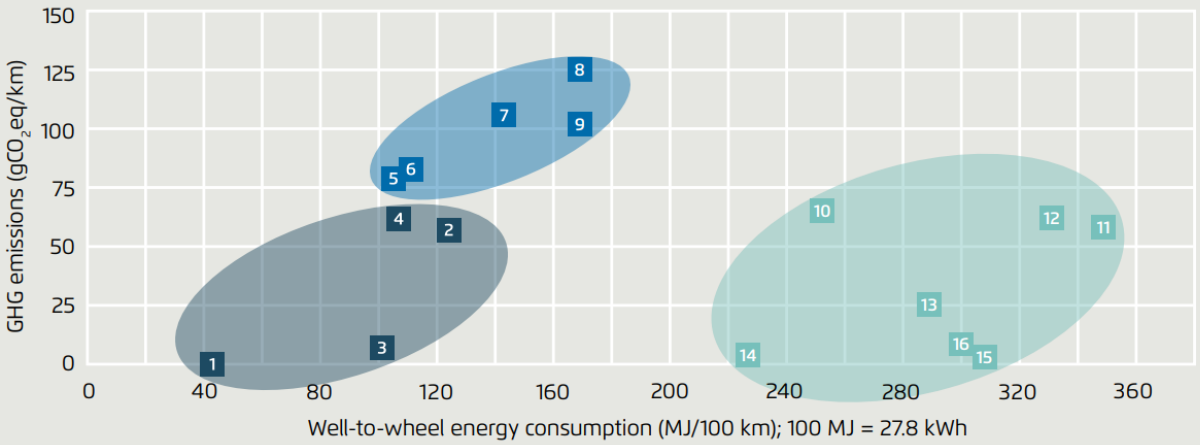
Production process for hydrogen, P2G methane and P2G fuels from sun and wind Figure 7.2



Source: AGORA, 2017

I. Consistency: E-fuels (or "E-fools" (from: TE, 2021))?

GHG emissions relative to energy consumption in 2020 (well-to-wheel) Figure 7.1



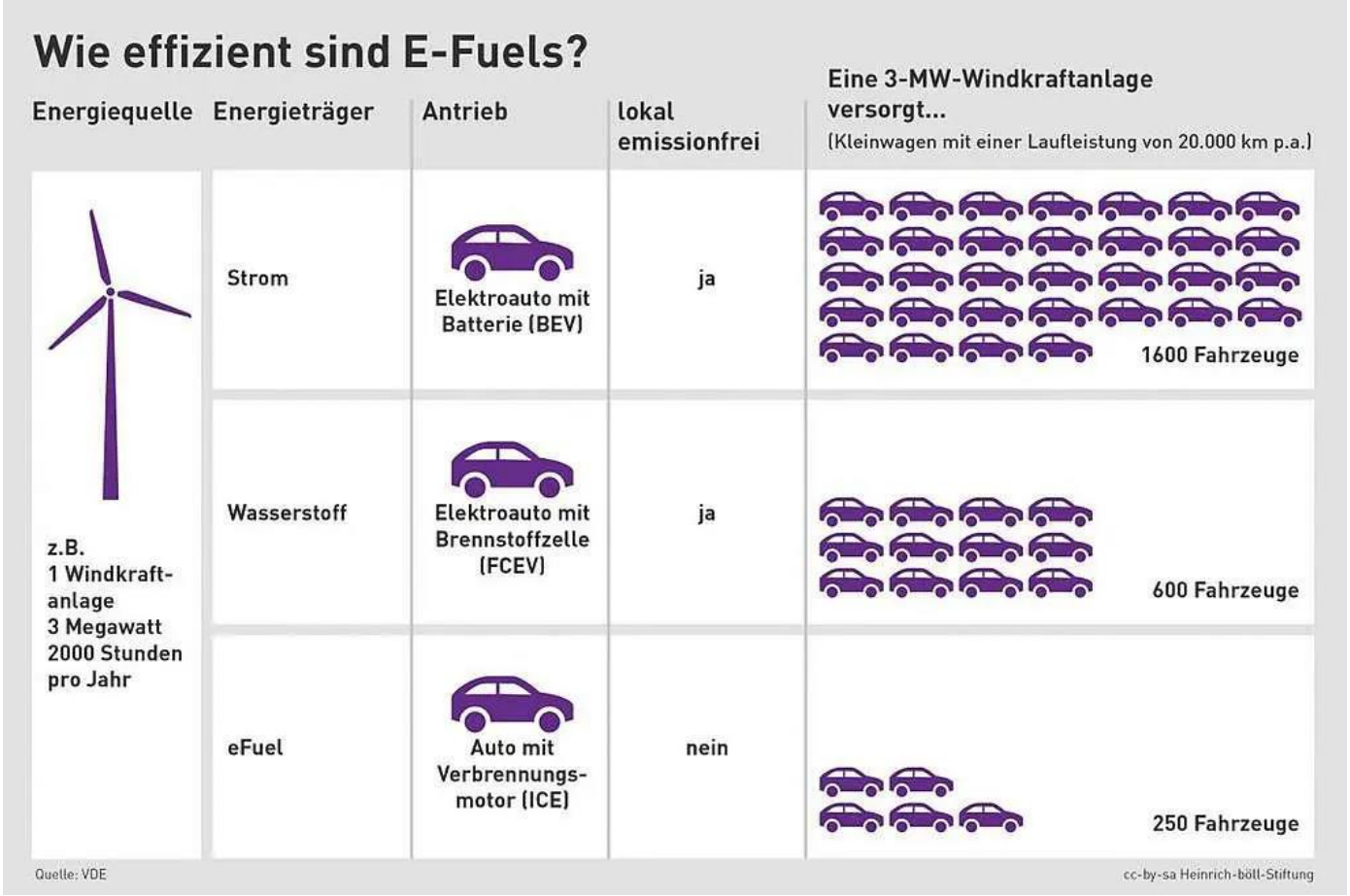
Electric vehicles
1 Electricity in BEV (wind)
2 Electricity in BEV (EU mix)
3 Hydrogen in FCEV (wind)
4 Hydrogen in FCEV (reforming of natural gas)

Fossil fuels
5 Hybrid diesel (petroleum)
6 Hybrid gasoline (petroleum)
7 Diesel (petroleum)
8 Gasoline (petroleum)
9 Natural gas (CNG)

Biofuels and synthetic fuels
10 Biodiesel (rapeseed)
11 Ethanol (sugar beet, used in E10 blends)
12 Biomethane (maize)
13 Biomethane (municipal waste)
14 Syndiesel (B2L, waste wood)
15 Syndiesel (P2L, renewable electricity)
16 Synmethane (P2G, renewable electricity)

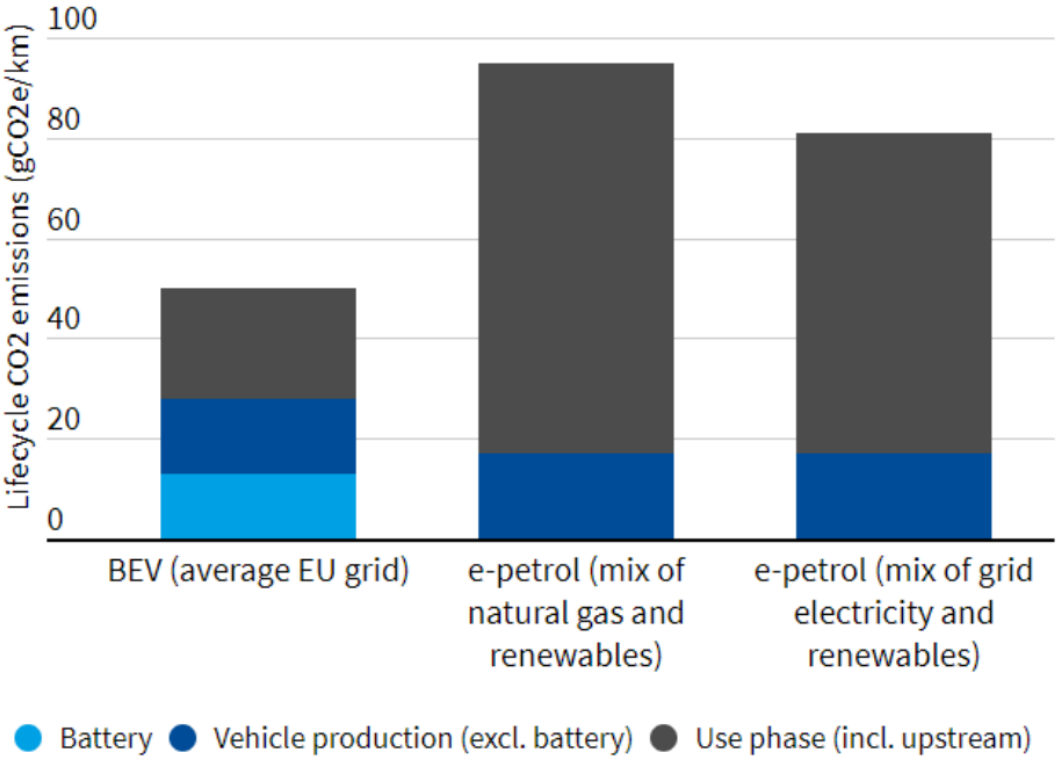
Source: AGORA, 2017

I. Consistency: E-fuels (or "E-fools" (from: TE, 2021))?



Source: E-Fuels im Vergleich: Energieaufwand, Kosten und Nachhaltigkeit - emobicon® | Die eMobil Experten!

I. Consistency: E-fuels (or "E-fools" (from: TE, 2021))?

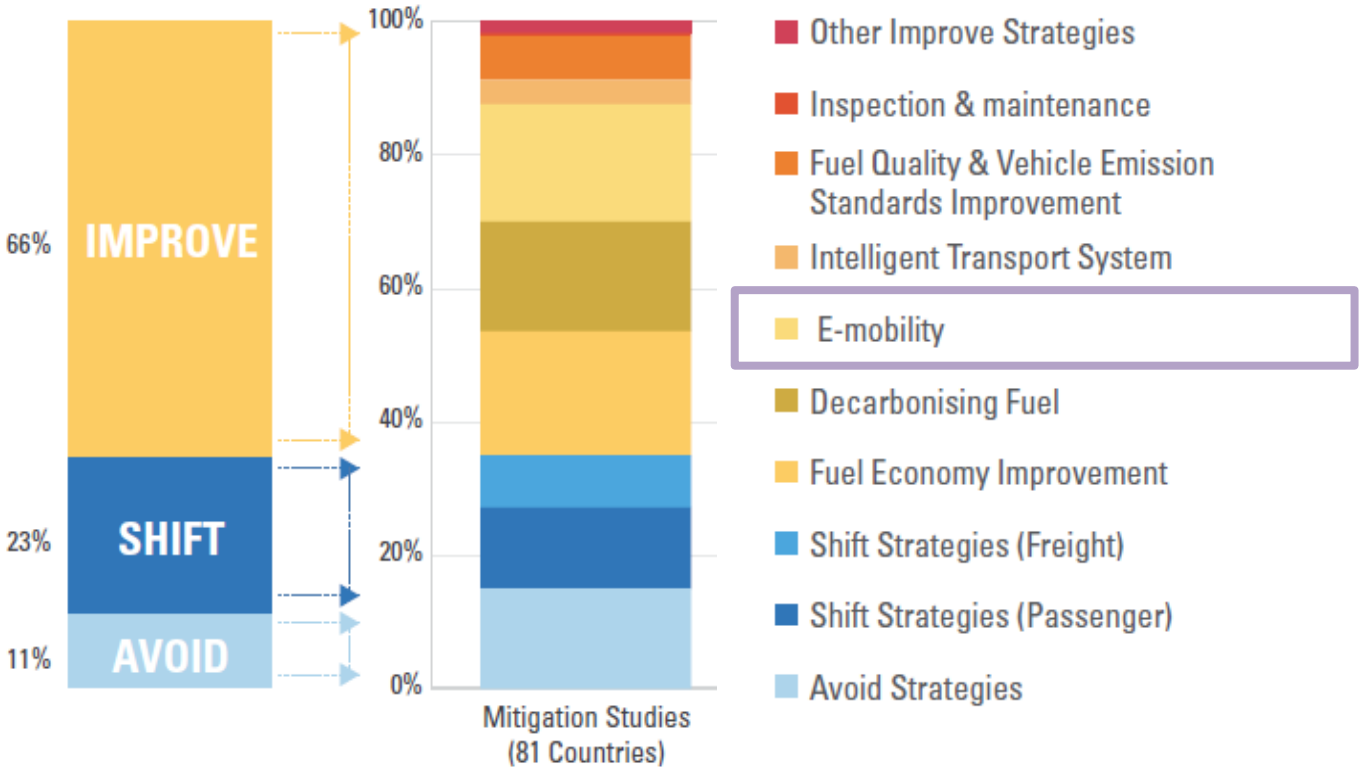


Source: TE, 2021. Efuels in cars briefing (transportenvironment.org)

Summary:

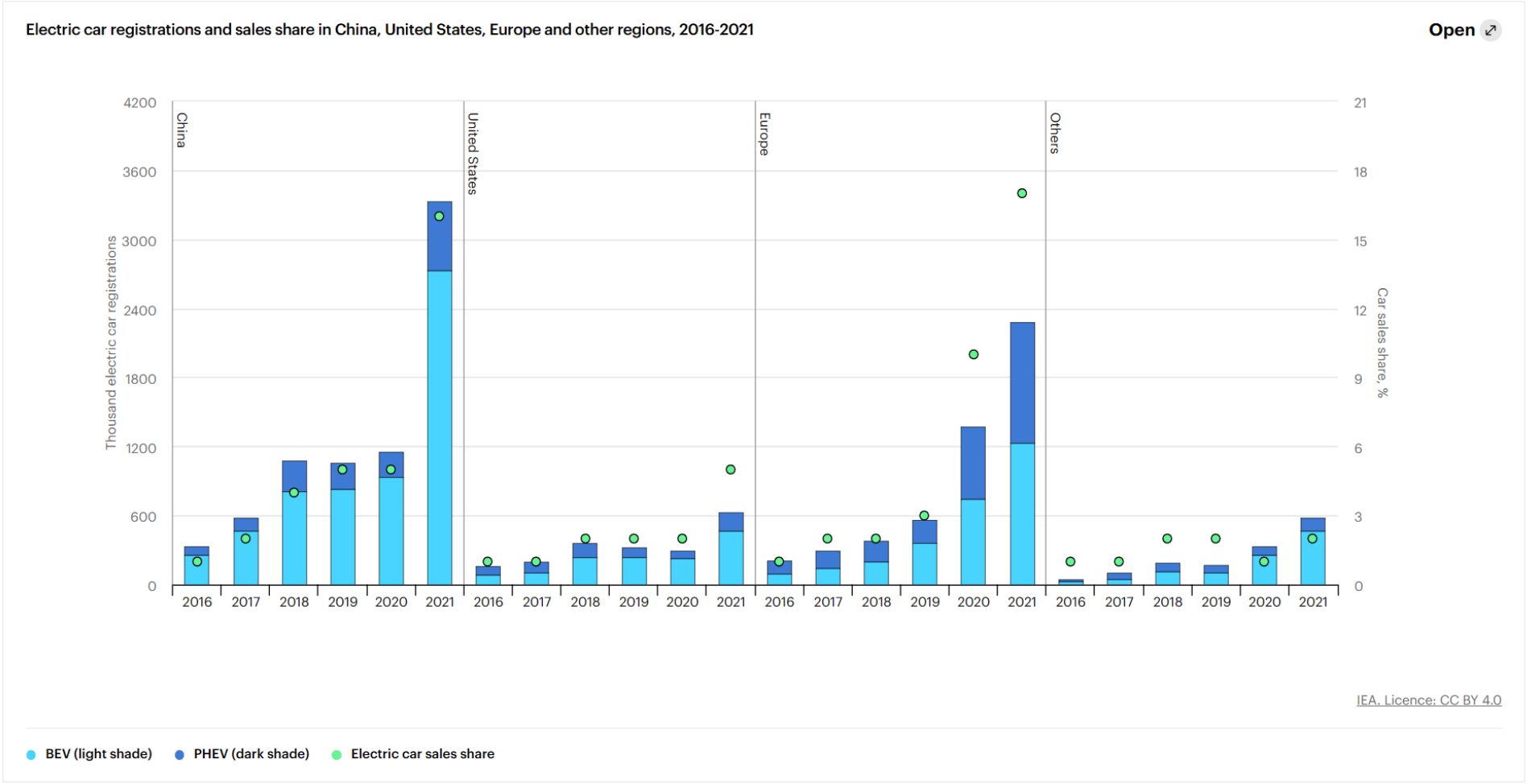
- Not climate neutral: CH4 and NOx
- More costly: ca. 2.80Eur/liter
- Not sufficient: 2% of european car fleet!
- Put pressure on green hydrogen economy

II. Consistency and efficiency: E-mobility



Source: Transport and Climate Change Report 2018, modified

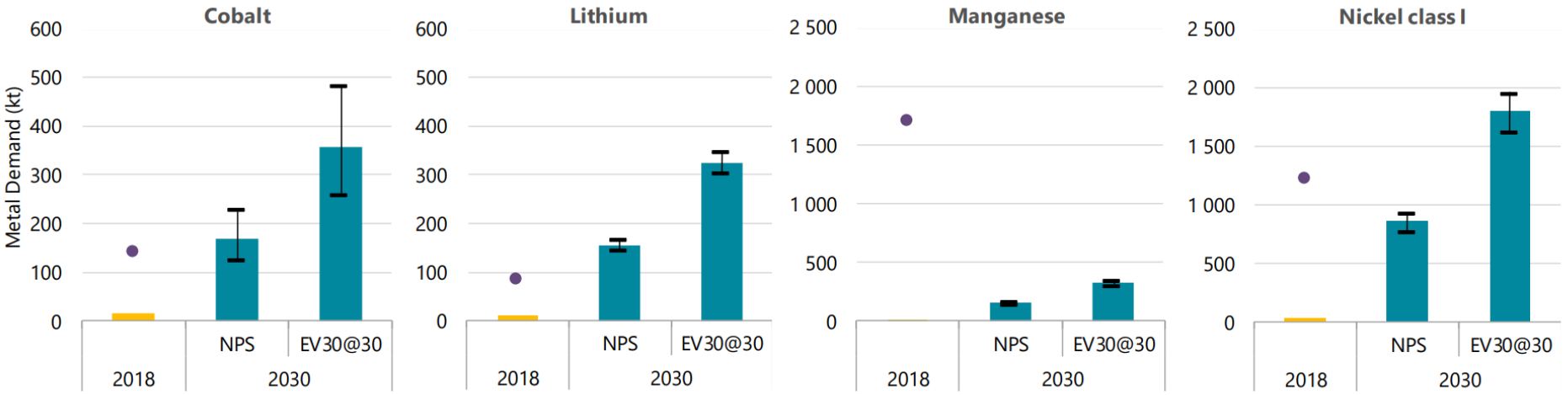
II. Consistency and efficiency: E-mobility



Source: [Electric Vehicles – Analysis – IEA](https://www.iea.org/reports/electric-vehicles) https://www.iea.org/reports/electric-vehicles

II. Consistency and efficiency: E-mobility

Increased annual demand for materials for batteries from deployment of electric vehicles by scenario, 2018-30



Note: The battery chemistry mix considered for 2030 in this analysis is composed of 10% of NCA, 40% of NMC 622 and 50% of NMC 811

Current demand: 71 kt/a
Total reserves: 8.3 million tons
www.statista.com/statistics/875808/cobalt-demand-worldwide/

Current demand: 292 kt/a
Total reserves: 22 million tons
Global lithium demand **volume** by application 2020-2030

Current demand: 3000 t/a
Total reserves: 89 million tons
https://www.statista.com/statistics/273634/

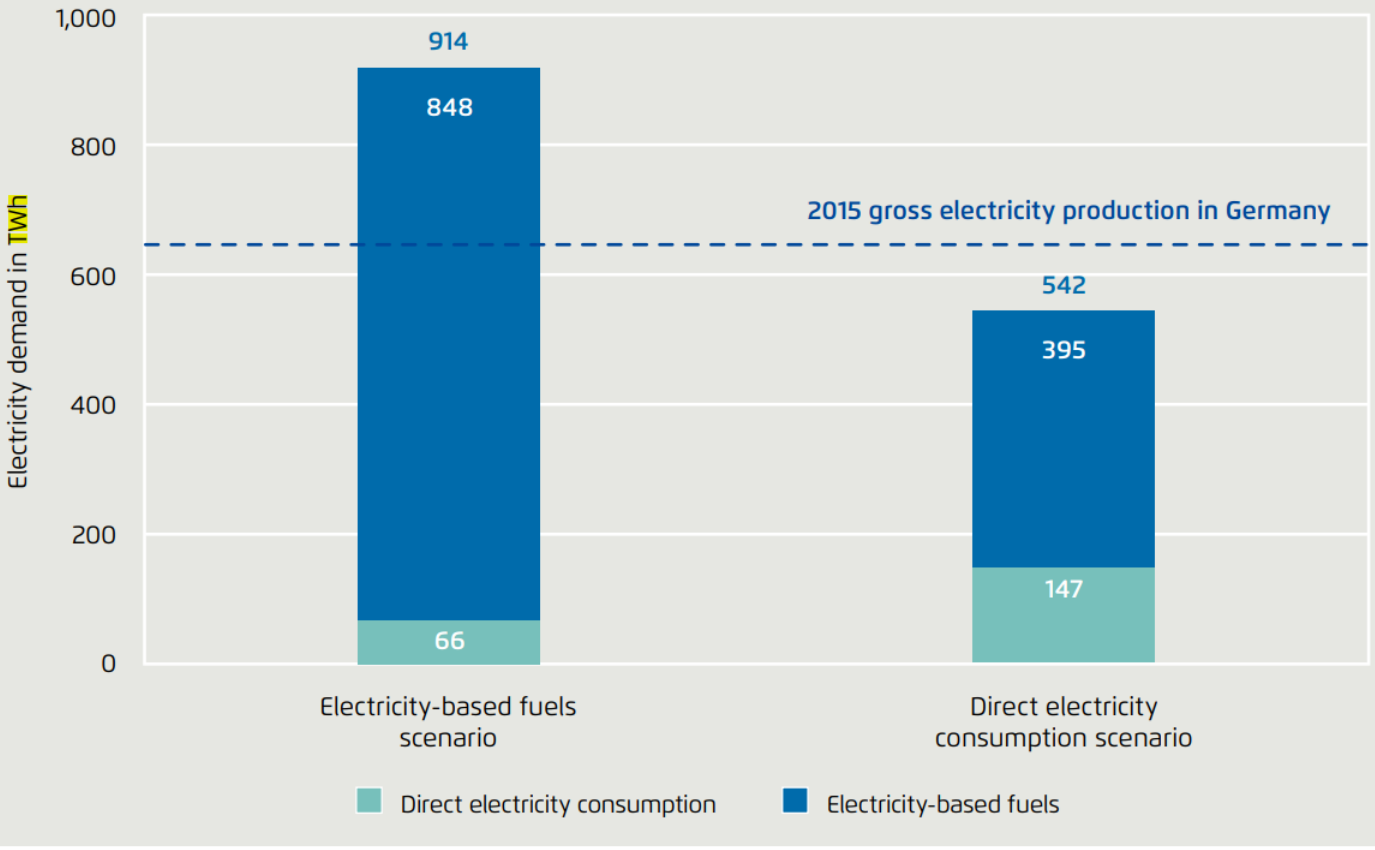
Source: https://www.itf-oecd.org/sites/default/files/docs/iea-global-ev-outlook-life-cycle-analysis.pdf

II. Consistency and efficiency: E-mobility

E- Fuels: ships & planes

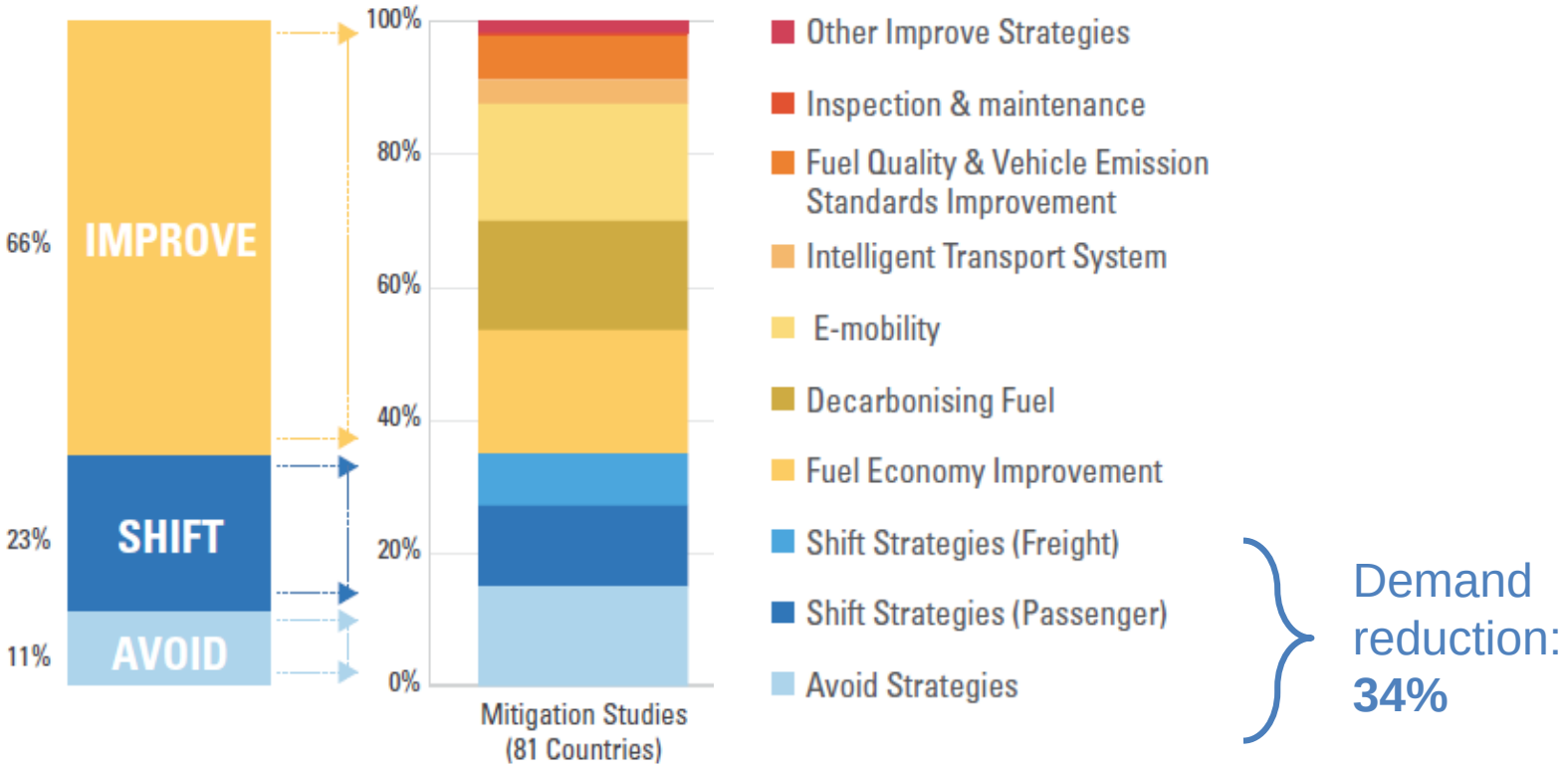
Electricity demand of transport sector (including international air travel from Germany and sea travel with German ports) in relation to decarbonisation strategy

Figure 7.3



Source: AGORA 2017

III. Sufficiency: Reduction



Source: Transport and Climate Change Report 2018, modified

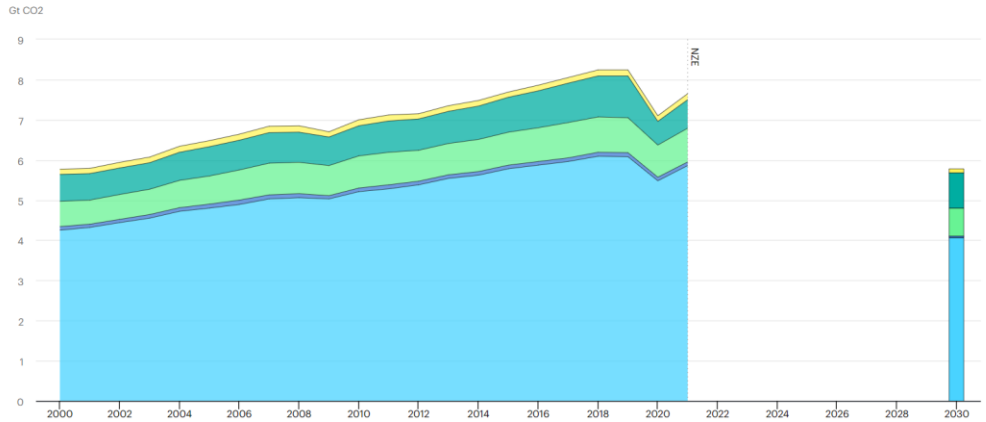
III. Sufficiency: Reduction

Pictures from Corona-Crisis

https://www.dw.com/de/corona-krise-deutschland-schafft-klimaziel-f%C3%BCr-2020-pandemie-merkel-deutschland-co2-covid-19/a-52862238

Global Co2 emissions from transport, in Gt

https://www.iea.org/data-and-statistics/charts/global-co2-emissions-from-transport-by-sub-sector-in-the-net-zero-scenario-2000-2030



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Thank you for your attention